MARSHALL STAR

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Dec. 4, 2003

NASA, Air Force achieve key milestones on Next Generation engine

by Rick Smith

NASA, the U.S Air Force and two prime aerospace contractors have successfully completed testing of two key rocket engine components —critical milestones in the development of innovative engine systems that could, within decades, power a new generation of American space launch vehicles.

The tests — of a new, liquid-hydrogen turbopump and a unique oxidizer preburner — are part of a project called the Integrated Powerhead Demonstrator, or IPD. The project is a joint venture between NASA's Next Generation Launch Technology program, managed for the Agency at the Marshall Center, and the Integrated High Payoff Rocket Propulsion Technologies program, managed for the Department of Defense by the U.S Air Force Research Laboratory at Edwards Air Force Base, Calif.

Both tests are part of component-level, risk-reduction studies, intended to lead to development of a hydrogen-fueled, full-flow, staged-combustion rocket engine —

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Photo by Doug Stoffer, NASA/Marshall Center

One NASA team visits MSFC

Johnny Stephenson, the Agency's One NASA implementation lead, emphasizes a point during a "One NASA Rollout" at the Marshall Center on Monday. Several key Agency leaders spoke to Marshall team members during an update session in Morris Auditorium, emphasizing One NASA as "One Team applying many unique capabilities to pursue one shared vision -- to improve life here, to extend life to there, to find life beyond." For more information on One NASA, go to www.onenasa.nasa.gov.

Aerospace Safety Advisory Panel named

Headquarters release

NASA Administrator Sean O'Keefe has announced the new NASA Aerospace Safety Advisory Panel (ASAP), which includes nine members, one ex-officio member and a new charter. The initial meeting of the new panel is expected soon.

"The Columbia Accident Investigation Board report clearly indicated we need to get back to basics with our safety assess-

*See **Safety** on page 4*

Voyager spacecraft may be entering solar system's 'final frontier'

Scientists debate if spacecraft has already reached milestone

Goddard/JPL release

NASA's Voyager 1 spacecraft is about to make history again. It is the first spacecraft to enter the solar system's final frontier of interstellar space – a vast expanse where wind from the sun blows hot against thin gas between the stars.

However, before it reaches this region, Voyager 1 must pass through the termination shock – a violent zone that is the source of beams of high-energy particles. Voyager's journey through this turbulent zone will give scientists the first direct measurements of our solar system's unexplored final frontier, the heliosheath. Scientists are debating if this passage has already begun.

Two papers about whether Voyager 1 has reached this milestone were published in the science magazine "Nature" in November.

The first paper, by Dr. Stamatios Krimigis of the Johns Hopkins University Applied Physics Laboratory in Laurel, Md., and his team, supports the claim Voyager 1 passed beyond the termination shock. The second paper, by Dr. Frank McDonald of the University of Maryland, in College Park, Md., and his team,

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Engine

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the first of its kind. The engine will employ preburners featuring both oxygen-rich and hydrogen-rich staged combustion, which help to cool engines during flight, achieve higher engine efficiency and reduce exhaust emissions.

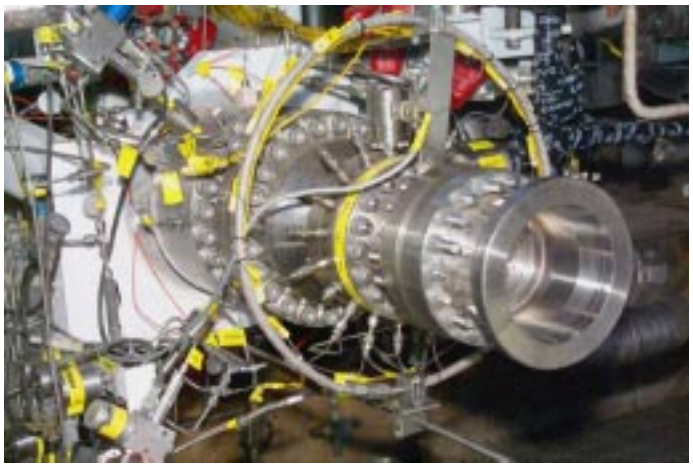
"Completion of these tests moves us two steps closer to full-scale, integrated testing of the entire IPD system," said Garry Lyles, manager of the Next Generation Launch Technology program, which manages the IPD project for NASA. "America's future in space hinges on cutting-edge technology development, and together with our Air Force and industry partners, we're focused on creating a more reliable, robust engine system."

Jeffrey Thornburg, IPD project manager for the Department of Defense at the Air Force Research Laboratory, said, "These testing successes wrap up a very exciting year for the IPD project. I can't say enough about how well the NASA, Air Force and industry team has come together to overcome many technical challenges to help us complete this testing."

Integrated system testing is scheduled to begin in late 2004 at NASA's Stennis Space Center near Bay St. Louis, Miss.

The Rocketdyne Propulsion and Power division of the Boeing Company of Canoga Park, Calif., developed the liquid-hydrogen fuel turbopump for NASA and the Air Force. The turbopump test series, conducted at the Stennis Space Center, was completed Oct. 29.

The turbopump is designed to provide high-pressure hydrogen to the rocket engine thrust chamber, enabling the combustion process and generating thrust. The turbopump extracts energy from hot gases, which are generated by the fuel preburner and flow through the turbine, causing the turbopump rotor to spin at more than 50,000 rpm. As the rotor spins, an impeller attached to the other end of the shaft pumps the hydrogen to pressures greater than 6,600 psi. These high pressures are necessary to generate the 3,000-psi combustion gases in the thrust chamber, which expand through the chamber and nozzle to produce 250,000 pounds of thrust.



Aerojet Corp. photo

The oxidizer preburner, intended to initiate the fuel combustion process for the Integrated Powerhead Demonstrator, generates oxygen-rich steam for use by the oxygen turbopump's turbine.

The design and technologies of the fuel turbopump address key life limitations of current reusable rocket engines, and is intended to achieve a lifespan goal of 200 flight missions and 100 flights between periods of engine refurbishment — 10 times the current capability of reusable rocket engines.

"We are very pleased with the results of the turbopump testing," said Don McAlister, IPD program manager at Boeing Rocketdyne. "We've met all our objectives and we've learned valuable lessons for future rocket engine design and testing. With the turbopumps well characterized, we can now move confidently into engine system testing next year."

Photo by David Higginbotham, NASA/Marshall Center

King lights holiday tree

Marshall Director David King speaks to Center team members Monday after lighting the annual holiday tree in front of Bldg. 4200. The tree is ringed by seven stars in memory of the Columbia astronauts.

Harry Ryan, IPD project manager at the Stennis Center, said, "With the successful completion of the fuel turbopump component test series, we have substantially lowered the risks associated with pursuing the future integrated engine system test series. Incremental component testing provides a building-block approach to identify key requirements and reduce risks associated with integrated engine development."

Testing of the oxidizer preburner was conducted by component designer Aerojet Corp. at its Sacramento, Calif., facilities. The test series was completed Oct. 28.

The oxidizer preburner — which initiates the combustion process – is designed to generate oxygen-rich steam for use by the oxygen turbopump's turbine. The preburner burns a large quantity of liquid oxygen with a small quantity of hydrogen to produce this steam, which then mixes with additional hydrogen fuel to be burned in the main combustion chamber.

The preburner is the first flight-capable, oxygen-rich

*See **Milestones** on page 3*

Cloud named business integration executive at Marshall

from the Human Resources Department

Marshall Director David King has appointed Sheila S. Cloud to the position of business integration executive in the Office of the Center Director.

Cloud joined the Marshall Center in 1983, where she immediately became involved in the development and execution of the NASA budget. In 1989, she served for a year as executive assistant to two Marshall directors, and routinely interfaced on institutional matters with virtually every level of Center management.

Marshall Imaging Services

Cloud

Later in her career as director of the Resources Management Office, she directed planning for all processes leading to the development of the Center's annual budget. In 1997, she was appointed to the Senior Executive Service as director of the Institutional and Program Support Directorate, which later became the Center Operations Directorate. In this capacity she directed a comprehensive array of institutional services.

She has extensive experience and expertise in the area of resources management. She has made significant contributions to numerous Agency teams and working groups. These include the Office of Space Flight Task Team that reengineered the budget structure for space flight programs, the Infrastructure Review Team that made a comparative institutional capability analysis of the four OSF Centers, and the Agency Full Cost Initiative Working Group. She also received Agency recognition for her leadership in planning and implementing a full-cost environment at the Marshall Center.

Cloud is the recipient of the NASA Exceptional Service Medal for her contributions to improving the planning and management of Agency resources. She received a Presidential Rank award in 2001.

Wang wins Toastmasters speech contest

Marshall team member Caroline Wang recently won the Toastmasters International Humorous Speech Contest for the Northern Alabama Division.

Representing North Alabama, she then placed third at the District 77 contest in Montgomery on Nov. 22.

Wang, president of the NASA Lunar Nooners Toastmasters, also won this year's club and area contests, qualifying her for the division contest. Her winning speech was entitled "My First Golf Tournament."

District 77 is comprised of 97 Toastmasters clubs throughout Alabama, Southern Mississippi and Northern Florida.

Marshall Imaging Services

Wang

Toastmasters International is the leading organization devoted to effective oral communication. Through its member clubs, Toastmasters International helps men and women learn the art of speaking, listening and thinking.

The NASA Lunar Nooners meet every Tuesday at in the Bldg. 4610 cafeteria from 11:30 a.m. to 12:30 p.m. It is open to all Marshall team members. For more information, call Bob Keener at 544-1159, or Becky Waters at (256) 348-5236.

Milestones

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preburner developed in the United States for a large-scale engine. The use of oxygen-rich steam to power the oxygen turbopump is intended to dramatically increase safety of engine system operation, limiting seal failure between the pump and the turbine that could leak extremely hot gases into the turbine and cause them to burn prematurely."

We are very excited about the operating characteristics demonstrated during the preburner testing," said Robert Werling, project manager for Aerojet. "They provided the thermal environments required to meet the extended turbine life goals, while providing the power necessary to realize the performance goals of the integrated engine system."

The Integrated Powerhead Demonstrator is a cornerstone of NASA's Next Generation Launch Technology program, which seeks to provide safe, dependable, cost-cutting technologies for future space launch systems, increasing engine operability and leading to aircraft-like flight operations. The project also is part of the Department of Defense's Integrated High Payoff Rocket Propulsion Technology program, which seeks to double the performance and capability of today's state-of-the-art rocket propulsion systems while decreasing costs associated with military and commercial access to space.

The writer, an employee of ASRI, supports the Media Relations Department.

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ment," O'Keefe said. "By recommitting ourselves to the original concept for the ASAP, we believe a stronger, more focused advisory panel will benefit the entire Agency well beyond our Return to Flight efforts."

Congress chartered the ASAP in 1967 after the Apollo One fire to act as an independent body to advise the NASA administrator on safety issues regarding operations, missions and other agency initiatives. The new charter calls for the ASAP to be composed of recognized safety, management and engineering experts from industry, academia and other government agencies.

Over the years, administrative procedures were added to govern the conduct of the panel. These procedures have been revoked, and the new panel will have the opportunity to develop its agenda in concert with the oversight findings of the Columbia Accident Investigation Board.

"By drawing on and tasking the technical support of the NASA Engineering and Safety Center, the panel will have a deep capacity to conduct comprehensive, independent, external oversight of our safety systems, operations and culture. We welcome the members' active participation in our efforts to emerge from the Columbia tragedy a smarter, stronger and safer Agency dedicated to exploration," O'Keefe said.

In late September 2003, 11 ASAP members and consultants resigned in the wake of the Columbia accident.

The new ASAP members are:

- Rear Adm. Walt Cantrell, U.S. Navy retired
- Vice Adm. Joe Dyer, U.S. Navy retired
- Augustine Esogbue, Ph.D., professor and director of the Intelligent Systems & Controls Laboratory in the School of Industrial and Systems Engineering at the Georgia Institute of Technology
- Maj. Gen. Rusty Gideon, U.S. Air Force retired.
- Deborah Grubbe, DuPont corporate director
- Rosemary O'Leary, J.D., Ph.D., professor of Public Administration and Political Science at the Maxwell School of Citizenship and Public Affairs at Syracuse University in New York
- John Marshall of Delta Airlines, vice president for Corporate Safety and Compliance in Atlanta and co-chairman of the Commercial Aviation Safety Team
- Steve Wallace, director of the Office of Accident Investigation for the Federal Aviation Administration and FAA representative to the National Transportation Safety Board
- Rick Williams, corporate safety director for Alcoa in New York and former director of Human Resources for Alcoa Primary Metals in Knoxville, Tenn.
- Ex-Officio Member Brig. Gen. Joseph Smith, U.S. Army, and director of the U.S. Army Safety Center at Fort Rucker, Ala.

The new ASAP will begin with the original charter, signed by then-NASA Administrator James E. Webb. New provisions help assure an independent, long-term oversight of the Agency's safety policies and programs. Some of the revisions include:

- The new ASAP will report quarterly instead of annually
- The term for new members is two years, extendable to a maximum of six years in order to stagger terms of service and ensure a fresh perspective at regular intervals
- The new ASAP focuses on NASA's safety and quality systems. ASAP will focus on industrial and systems safety, risk management, trend analysis and the management of these activities.

"We've taken extra steps to ensure the independence of this panel," said Associate Administrator for Safety and Mission Assurance Bryan O'Connor. "While the original law and the new charter allow for NASA members, none of the new members is a current or former Agency employee or contractor."

The new ASAP is also expected to play an important role in the ongoing safety assessment and review of the Space Shuttle program after Return to Flight.

"We intend for the ASAP to oversee our implementation of the Columbia Accident Investigation Board's recommendations long after the work of the Stafford-Covey Return to Flight Task Group is completed," O'Keefe said. "Our intent is to institutionalize a renewed commitment to safety, and the panel will help us assure that we follow through on that objective."

The new Aerospace Safety Advisory Panel charter and member biographies are available on the Web at:

http://www.nasa.gov/news/highlights/returntoflight.html.

Photo by Emmett Given, NASA/Marshall Center

PAD Abort Demonstrator team visits Marshall

Watching a PAD hot-fire engine test last week in the East Test Area, are, from left, Dr. Jan Davis, director of the Marshall Center's Safety & Mission Assurance Office; Johnson Space Center Director Jeff Howell; and Chuck Shaw, Pad Abort Demonstrator (PAD) manager for the Johnson Space Center. The test was the first in the evaluation of potential crew escape designs for the Orbital Space Plane in the event of a launch pad emergency. The PAD will be a full-scale, reusable system designed to protect and safeguard crewmembers regardless of which OSP concept is selected to be built.

Voyager

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disputes the claim. A third paper, published Oct. 30 in "Geophysical Research Letters" by Dr. Leonard Burlaga, and collaborators, states Voyager 1 did not pass beyond the termination shock.

"Voyager 1 has seen striking signs of the region deep in space where a giant shock wave forms," said Dr. Edward Stone, Voyager project scientist at the California Institute of Technology in Pasadena, Calif. "The observations surprised and puzzled us, so there is much to be discovered as it begins exploring this new region at the outer edge of the solar system."

Launched on Sept. 5, 1977, Voyager explored the giant planets Jupiter and Saturn before being tossed out toward deep space by Saturn's gravity. It is approaching, and may have temporarily entered, the region beyond termination shock. At more than 8 billion miles from the sun, Voyager 1 is the most distant object from Earth ever built by humans.

The termination shock is where the solar wind, a thin stream of electrically charged gas blown constantly from the sun, is slowed by pressure from gas between the stars. At the termination shock, the solar wind changes speed abruptly from its average of 700,000 mph to 100,000 mph.

Estimating the location of the termination shock is hard, because scientists and astronomers don't know the precise conditions in interstellar space. They do know speed and pressure of the solar wind changes, which causes the termination shock to expand, contract and ripple.

From about Aug. 1, 2002, to Feb. 5, 2003, scientists noticed unusual readings from the two energetic-particle instruments on Voyager 1, indicating it had entered a region of the solar system unlike any previously encountered. This led some to claim Voyager 1 may have entered a transitory feature of the termination shock.

The controversy would be resolved if Voyager could measure the speed of the solar wind, because the solar wind slows abruptly at the termination shock. However, the instrument that measured solar wind speed no longer functions on the venerable spacecraft. Scientists must use data from instruments still working to infer if Voyager pierced the termination shock.

"We have used an indirect technique to show the solar wind slowed down from about 700,000 mph to much less than 100,000 mph," Krimigis said. "We used this same technique when the instrument measuring the solar wind speed was still working. The agreement between the two measurements was better than 20 percent in most cases."

Burlaga, however, said, "The analysis of the Voyager 1 magnetic field observations in late 2002 indicate that it did not enter a new region of the distant heliosphere by having crossed the termination shock. Rather, the magnetic field data had the characteristics to be expected based upon many years of previous observations, although the intensity of energetic particles observed is unusually high."

Two Voyager spacecraft, Voyager 1 and Voyager 2, were built and are operated by NASA's Jet Propulsion Laboratory. The spacecraft are controlled and their data returned through NASA's Deep Space Network, a global spacecraft tracking system. For their original missions to Jupiter and Saturn, the Voyagers were destined to explore regions of space where solar panels would not be feasible, so each was equipped with three radioisotope thermoelectric generators to produce electrical power for the spacecrafts' systems and instruments. Steadily operating for 26 years, the Voyagers owe their longevity to these generators, which produce electricity from the heat generated by the natural decay of plutonium dioxide.

Wright brothers, Centennial of Flight exhibit available online

The Wright brothers will long be remembered for their first successful flight on Dec. 17, 1903. In connection with the Centennial of Flight, the Library of Congress has released an online exhibit of personal papers and images of the Wright brothers. Included in the exhibit are diaries detailing glides and powered flight, family correspondence, scrapbooks and drawings. To view the exhibit, go to http://memory.loc.gov/ammem/wrighthtml/wrighthome.html.

Photo by Emmett Given, NASA/Marshall Center

Discussing propulsion, inspiring the next generation

George Hopson of Marshall's Space Shuttle Main Engine Project Office speaks to students in a propulsion class at the University of Alabama at Tuscaloosa. Hopson summarized solutions to difficult propulsion problems facing engineers during development of the Saturn V stages during the Apollo Lunar Landing Program.

Obituaries

Thomas S. Bullard, 78, of Huntsville, died Nov. 14. Burial was in Huntsville Memory Gardens with Berryhill Funeral Home directing.

Bullard was born Dec. 25, 1924 and retired from the Marshall Center in 1974 where he was an aerospace engineering technician. He was a World War II veteran and the widower of Eunice Bullard.

He is survived by one son, Randy Bullard of Grant; three daughters, Sandy Bolan of Decatur, Sherry Hall of Weaver and Deena LeMay of Toney; one brother, J.W. Bullard of California; two sisters, Janie Myrick of Talladega and Diane McBee of Pearl, Miss.; 11 grandchildren; and 21 great-grandchildren.

Joseph P. "Bill" Cantrell Jr., 75, of Huntsville, died Nov. 4.

Burial was in Maple Hill Cemetery in Huntsville with the Rev. Dale Cantrell and Rev. Dennis McAnally officiating and Spry Funeral Home directing.

Cantrell was born Dec. 13, 1927, in Limestone County but grew up in Madison County. He was a U.S. Army veteran and retired from the Marshall Center in 1979 where he was a program analyst.

He is survived by his wife, Lula Jean Cantrell; five sons, Dick Cantrell of Athens, Dale Cantrell of Hazel Green, and Duane Cantrell, William Cantrell and Robin Cantrell, all of Huntsville; one daughter, Rebecca Hyatt of Hazel Green; one brother, Robert L. Cantrell of Lawton, Okla.; two sisters, Lucille Thompson of Lewisburg, Tenn., and Cathryn Wells of Lester; 18 grandchildren; and 16 great-grandchildren.

Sytha J. Fedrowisch, 78, of Huntsville, died Nov. 9. Burial was in Maple Hill Cemetery with the Rev. Alan Crawford officiating and Spry Funeral Home directing.

Fedrowisch was born March 5, 1925 in Huntsville and was a member of Oak Park Baptist Church. She retired from the Marshall Center in 1981 where she was a secretary for Spacelab.

She is survived by two sons, Robert Fedrowisch of Huntsville and David Fedrowisch of Hazel Green; one daughter, Judy Kincaid of Huntsville; one brother, James 'Boots" McCulley of Huntsville; two sisters, Choncie Grayson of Huntsville and Marguerite Phillips of Gurley; and three grandchildren.

Herman Boyd Roberts, 91, of Athens, died Oct. 24. Burial was in Limestone Memorial Gardens with Bud White officiating and Spry Funeral Home directing.

Roberts was born April 14, 1912 in Etowah County. He retired from the Marshall Center in 1972 where he was an aerospace engineer technician. He was a farmer, a real estate developer and member of the Baptist Church. He was the father of the late D.C. Roberts.

He is survived by his wife, Nellie Roberts; five sons, Joseph Martin Roberts, James A. Roberts and Clayburn Roberts, all of Danville, Ill., and Herman Leon Roberts of Rogersville and Ray Roberts of Athens; three daughters, Ruby Brown of Jacksonville, Neta Faulkner of Elkmont and Mary Miller of Athens; one brother, Sam Roberts of Rosalie; one sister, Lucille Hill of Hillsboro; 30 grandchildren; 28 great-grandchildren; and two great-great-grandchildren.

James Carr Robinson, 78, of Huntsville, died Nov. 19. Funeral services were held at St. Matthew's Episcopal Church with the Rev. John McKee Sloan officiating.

Robinson was born Oct. 26, 1925. He retired from the Marshall Center in 1981 where he was an aerospace engineer. He also was retired from USBI, served in the U.S. Army and the U.S. Navy and was a member of the Episcopal Church.

He is survived by his wife, Ethel Robinson; two sons, Jeff Robinson and Bill Thomas; four daughters, Kim Robinson, Ann Marshall, Kathy Knox and Becky Millimaki; 12 grandchildren; and four great-grandchildren.

James S. Strong, 71, of Huntsville, died Nov. 9. Burial was in Maple Hill Cemetery with Dr. Garry Jordan officiating and Spry Funeral Home directing.

Strong was a Madison County native and retired from the Marshall Center in 1987. He was a U.S. Army veteran and a member of the Baptist Church.

He is survived by his wife, Barbara Strong of Huntsville; four daughters, Laura Lea Townsend and Susan S. Holt, both of Huntsville, and Lynn Schmitz of Winchester, Tenn., and Kimberly Alford of Owens Cross Roads; four brothers, Bob Strong of Toney, Tommy Pridmore and Roger Pridmore, both of Harvest, and David Pridmore of Lincoln County, Tenn.; and 10 grandchildren.

Job Announcements

MS04N0054, Program Analyst. GS-0343-12, Science Directorate, Business Management Office. Closes Dec. 8. Contact: Deborah Longeddy at 544-2308.

MS04C0056, Executive Support Assistant. GS-0303-08, Procurement Office. Closes Dec. 4. Contact: Allan Day at 544-4079.

MS04C0058, AST, Data Systems. GS-0854-14, Engineering Directorate, Avionics Department, Flight Software Group. Closes Dec. 8. Contact: Allan Day at 544-4079.

Announcements

Full Cost in Practice course available for Marshall team

A Full Cost in Practice course for Marshall team members will be offered in December. The course focuses on working and managing in a full cost environment. Participants should bring a calculator. Registration is through AdminSTAR. For more information and course schedules, see "Inside Marshall." For questions on registration, call Tina Smith at 544-7834.

'I Think Safe Because ... ' badges available Monday

The Marshall Safety and Health Action Team will be making free "I Think Safe Because ... " badges from 11 a.m.-1 p.m. Monday in the lobby of Bldg. 4203. Marshall team members should bring a small photo to be laminated onto the card.

Ovation Arts tickets discounted for Marshall team members

The NASA Exchange is offering all Marshall team members and retirees a $2 discount on all Ovation Arts concerts and musicals. To receive the discount, team members or retirees should present their badge at the time of ticket purchase. Tickets are available at Shaver's Books in Huntsville, "Mulberry Street" in Madison and by calling 468-1632 or 468-1633. Scheduled events include the "Annual Christmas Concert" on Dec. 12 and Dec. 13 at 7 p.m. at the Madison Municipal Complex. For more information, go to http://ovationarts.net.

Tactical Interceptor Design Symposium set for Jan. 16

A Tactical Interceptor Design Symposium will be from 8 a.m.-4:30 p.m. Jan. 16 in the Tom Bevill Center at the University of Alabama in Huntsville. The event is sponsored by the university and the American Institute of Aeronautics and Astronautics. For more information go to http://www.eb.uah.edu/ipt/.

Marshall Exchange Council election ends Dec. 12

Two Marshall employees, Tereasa Danne and George S. Mitchell, are vying to fill one vacancy on the Marshall Exchange Council. Civil servants must cast their vote by Dec. 12. The Exchange Council develops an annual budget to support various morale and welfare activities on behalf of Marshall team members. For more information, see "Inside Marshall" or go to http://ntf-2.msfc.gov/exchange.nsf.

NASA Ski Week set for January

The 13th annual NASA Ski Week will be in Steamboat, Colo., Jan. 24-31. Skiers from nine NASA centers will participate in winter sports and camaraderie at the 3,000-acre resort. All Marshall team members, retirees and family members, are eligible to participate. For more information, call 233-0705 or e-mail tom.dollman@nasa.gov.

CAIB report volumes available

Volumes II-VI of the Columbia Accident Investigation Board report are available on the NASA Web site at www.nasa.gov. These volumes contain appendices and additional information, which provides supporting documentation for the main text of Vol. I of the report. Hard copies of the Volumes I-VI are available through the Government Printing Office and can be ordered at www.gpo.gov.

SHARP mentors needed for 2004 summer session

The Marshall Center's Education Programs Department is seeking volunteers to work with students during the 2004 session of the NASA Summer High School Apprenticeship Program. The program offers high school students an opportunity to participate in an eight-week science and engineering apprenticeship. Marshall volunteers, including researchers, scientists and other engineering professionals, serve as mentors to the students. For more information, call Jennifer Simmons at 961-7544.

Mentors needed for Equal Opportunity summer internships

Mentors from all technical directorates at the Marshall Center are needed for the Equal Opportunity Office 2004 Summer Internship Program. Mentors will work with undergraduate students for 10 weeks. For more information, call Madeline Hereford at 544-7420.

Exchange sponsoring shoe sale

The Marshall Exchange is sponsoring a sports shoe sale Dec. 9-11 from 8:30 a.m.-4 p.m. each day in the Bldg. 4203 lobby. Sports shoes for men, women and children will be available for $19.95 each plus tax. Buy four pairs of shoes and get one pair free. For more information, call Candy Kelley at 544-7565.

For more Announcements, see "Inside Marshall"

Driver's unsafe act obstructs emergency response

A Marshall team member's Flash Mishap Report on the Safety, Health and Environmental Web site on "Inside Marshall" is a reminder for all drivers to yield to emergency vehicles on Redstone Arsenal.

The report describes a privately-owned vehicle that failed to change lanes or yield the right of way to a fire truck. With lights flashing and siren sounding, the fire truck was turning left onto Rideout Road in front of Bldg. 4200. The car driver's unsafe act forced the fire truck to an abrupt halt, blocking northbound lanes, and delayed emergency responders in their efforts to reach another emergency scene.

For more safety facts, tips, reports and highlights, or to file a report, go to the SHE Web site on "Inside Marshall" or http://inside.msfc.nasa.gov/SHE/.

Classified Ads

Miscellaneous

★ Two new western/cowboy belt buckles, 3"X4" w/bronc rider, German silver. $20 ea. 880-7490
★ La-Z-Boy recliner/beige, $40; Quasar microwave, $25; Men's Schwinn bicycle, 26", 5-speed, $25. 881-5642
★ Stamina Fitness station/bench w/leg attachment, Olympic weights, dumbbell handles, over 300 lbs. weight, $150. 679-6259
★ IDE hard drive, 30 gig, Maxtor or Western Digital 7200, $30. 658-4893
★ Nintendo 64 w/case; GameBoy pack & extras, Pod Racer, Tony Hawk 1 & 2, $50. 881-1895
★ Sears heavy duty all fabric dryer, $40. 883-2948
★ Four Ball Conant solid Maple Windsor chairs, 2 w/arms, $150 ea. 883-0164
★ King-size waveless waterbed mattress, heater, 24 water coils (not fiber fill), $150. 828-7152
★ Polished dual cold air induction system, off a 96 Camaro Z-28, w/K&N filter, $200. 883-8492
★ Kilipsch equiv corner horns, mahogany finish, $1,000; two 15" subwoofer speakers, $50 ea. 256-656-2965
★ 1994 mobile home, 14x70, 2BR, 2BA, deck, appliances, near Somerville, $15,000. 256-423-6548
★ La-Z-Boy matching sofa & loveseat, blue cloth, 7-yrs. old, $400 for both. 655-3065
★ Wood bunk beds, includes comforter w/ hunter green duvets, $500. 828-7850
★ Sectional sofa w/sleeper & recliners, hunter green, $400. 828-2528
★ Sewing machine, Pfaff Hobbymatic 955, $300. 883-2065
★ 1977 Avion travel trailer, 27', for hunting, camping, or lake lot, $4,500. 931-427-2059
★ Danish heating stove, blue enamel cast iron, Morso stove for wood/coal, pipe included, $350. 534-6671
★ Large overstuffed sofa and love seat, $500; IMAC computer & Epson printer, $200. 536-5132
★ Two sets Pioneer speakers, 6.5", TS-06196/TS-06096, 30W, stock from Honda CR-V, $5 each. 765-532-4218
★ Silk Christmas tree, 6-1/2', $25; large box of Christmas decorations, $25. 837-1774
★ Two solid pine desks, keyboard tray, hutch, $60 each; two cabinets/book-shelves, $60 each. 881-6016
★ TI-85 graphing calculator w/manual, $40; two Harman/Kardon speakers, $15. 721-0042
★ Nordic-Track Walk Fit exercise treadmill, $75. 883-6444
★ VOX Cambridge Twin guitar amp w/ chrome stand, 30 watts, two 10-inch speakers. $400. 306-0700 Decatur

Vehicles

★ Two Ford Fiestas, good for parts, $200 for both. 256-527-0705
★ 2000 Mazda 626, 4-door, 41K miles, silver w/gray interior, PS/PB/PL, CD, cassette, a/c, $9,950. 256-230-0806
★ 1990 Ford T-Bird, super-coupe, 5-speed, one-owner, 178K miles, $2,000. 539-8899
★ 2000 Volvo S70 AWD, platinum, 5-cyl., auto, sunroof, tape/CD, 90K miles, $14,500. 256-891-1073
★ 2001 Explorer Sport, automatic, CD player, 48K miles, $12,400. 714-2578
★ 1982 Silverado, 4x4, new rebuilt motor, 350 plus extras, $2,700. 773-8877
★ 2001 Honda Foreman ATV, electric shift, $5,000. 233-4104
★ 1996 Toyota Camry LE, Beige, 92K miles, single owner, $5,850. 772-4205
★ 1986 S-10 Chevy pickup, 4-speed, 4 cyl., eng. toolbox, $1,500. 931-937-6518
★ 2001 Dodge Dakota Sport, ext. cab, V6/ auto., silver w/gray interior, 17K miles, warranty, $11,900. 256-753-2928
★ 1996 Chrysler Town & Country LXI, leather, every option, white, 124K miles, $4,200. 325-6000
★ 2000 Toyota Tundra SR5 access cab, V8, two tone, CD, 52K miles. 233-3407
★ 1997 Dodge Grand Caravan SE, 3.3L/ V6, 110K miles, $4,995. 461-8359
★ 2002 Dodge Ram SLT 1500 Quad-Cab, 23K miles, graphite, Line-X bedliner, maintenance records. 880-5182
★ 1986 Corvette, red on red, 4 3 manual transmission, Z51, 86K miles, $8,800. 881-8446

Wanted

★ Palm V or Vx, in good condition. 337-4321
★ 305 Motor for 1985 Pontiac Firebird. 256-586-7015
★ Used Power Wheels jeep for child, in good condition. 564-7534
★ Non-working Canon S6000 or other Canon Inkjet printer for parts. 461-8721
★ Experienced electrician to assist homeowner w/wiring new house. 536-7906

Free

★ Hardwood, trees are down and piled, you cut and haul. 828-0103

Lost

★ Men's Gold wedding band in or near Bldg. 4203, reward. 430-2856

Found

★ Keys with flashlight & several grocery tags, call 544-4763 to claim and identify.

MARSHALL STAR
Vol. 44/No. 12

Marshall Space Flight Center, Alabama 35812
(256) 544-0030
http://www1.msfc.nasa.gov

The Marshall Star is published every Thursday by the Internal Relations and Communications Department at the George C. Marshall Space Flight Center, National Aeronautics and Space Administration. Contributions should be submitted no later than Monday noon to the Marshall Internal Relations and Communications Department (CD40), Bldg. 4200, room 101. Submissions should be written legibly and include the originator's name. Send electronic mail submissions to: intercom@msfc.nasa.gov The Marshall Star does not publish commercial advertising of any kind.

Manager of Internal Relations and Communications — Steven Durham
Editor — Jonathan Baggs

U.S. Government Printing Office 2002-633-065-60082

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